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POCKET COMPUTER NEWSLETTER

P.O. Box 232, Seymour, CT 06483

SCELBI PUBLICATIONS IS OUR NEW PUBLISHER

On March 16, 1981, SCELBI Publications announced the purchase of the POCKET COMPUTER NEWSLETTER from its founding editor, Nat Wadsworth. SCELBI Publications, a producer of microcomputer products and microcomputer publications since 1973, will provide advertising, publication and fulfillment services. Nat Wadsworth will continue as editor.

RADIO SHACK TRS-80 PC INTERFACING SIGNALS

An investigation of the interfacing signals used on the TRS-80 PC has been underway for some time by a number of interested parties. The information provided here may be of value to fellow investigators. For reference purposes in the following discussion, we have assigned interface connector pin numbers as follows. When looking at the front of the tape cassette interface, the top pin is referred to as Pin 1 and the bottom as Pin 9, as shown in the accompanying diagram (Fig. 1).

Pins 1 through 5 are not associated with the use of the cassette interface. Indeed, they are not connected to anything on the cassette interface side.

Pins 6 through 9 are utilized by the cassette interface. Pin 9 appears to serve as a common connection. Using pin 9 as a reference point, the following information has been gleaned.

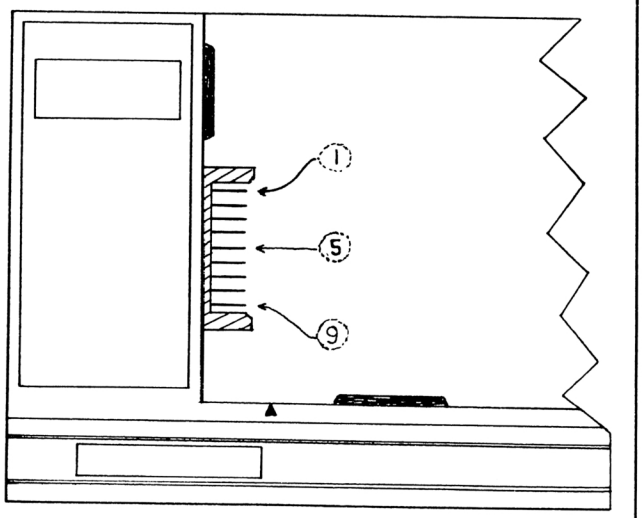

Figure 1

Pin 6 goes from a high state (4.5 volts) to a low state (0.4 volts) whenever the PC is in the tape read (CLOAD) or tape write (CSAVE) mode. It returns to the high state as soon as the operation is completed. This switching of states is synchronous with the audible tone that the PC emits whenever a tape read or tape write operation is in process. The signal on this pin activates a small relay that is part of the tape interface unit. The relay is activated when the signal on pin 6 goes low (0.4 volts). The contacts of the relay close under this condition to effectively "short" the plug that goes to the remote control jack on the tape unit.

Pin 7 routes data from the PC when the CSAVE command is used. During the time when tape "leader" is being generated (at the start of a tape save operation), a square wave of approximately 3800 Hertz is generated. When data is being transmitted, this frequency appears to alternate with a signal of half that rate (roughly 1900 Hertz).

Pin 8 passes data from the tape interface to the PC. Naturally, for data recorded using the PC, the received data is the same frequency as that used to store the information.

Does anybody know what pins 1 through 5 are used for on the Radio Shack TRS-80 Pocket Computer? We have lots of interested readers who would like to learn more about this area of the little computer's operation!

PROGRAMMING HINTS & TIPS

Norlin Rober of Marshalltown, Iowa, passes along these tips of interest to Radio Shack TRS-80 Pocket Computer users:

All closing parentheses may be omitted at the end of a line or at the end of a statement within a multiple-statement line or at the conclusion of the first part of an IF or FOR statement. Exception: The closing parenthesis used to complete a variable subscript may not be omitted.

The use of implied multiplication (e.g. 3AC rather than 3*A*C) when possible, can save bytes. Often rearranging operations within a statement permits greater utilization of implied multiplication. Also, expressions such as (5+A)B are legal, though not B(5+A).

Logical tests can often be replaced by logical calculations or by use of the SGN function; the result is often not only a shorter statement, but also the elimination of an extra program line, permitting more economization through the use of multiple statements. Some examples:

Use IF A rather than IF A > 0

Use IF −A rather than IF A < 0

Use D=D+(A < 5 rather than IF A < 5 LET D=D+1

Use D=D + ABS SGN A
rather than IF A <> 0 LET D=D+1

Use IF A IF B IF C as the logical
equivalent of IF A > 0 AND B > 0 AND C > 0

Closing quote marks may be deleted at the end of a line (though not at the end of a statement within a multiple-statement line).

Stored variables are rounded to 10 significant digits, whereas calculations performed within statements are performed using 12 digits. Thus maximum accuracy is retained by storing intermediate results as seldom as possible.

Norlin has also done some investigations into the accuracy of the built-in transcendental functions of the Radio Shack TRS-80 PC and reports that they are quite accurate, with the following exceptions:

Trigonometric functions are (unavoidably) inaccurate in RADIAN mode, for inputs near multiples of PI/2.

Example: tan 1.570796326 = 1258025227
TRS-80 PC gives 1273239545

Inverse cosine is weak for inputs near 1. (Accuracy is lost because the internal algorithm uses $1-X^2$, which will contain too few significant digits).

Example: ACS 0.999990007 = .2561450312 (Deg mode)
TRS-80 PC gives .2561456711

LOG is weak for inputs near 1 that are less than 1. The reason is that internally the computer calculates –LOG 1/X, giving an error in the 12th significant digit that becomes serious when X is near 1.

Example: LOG .99999684 = –.000001372372731
TRS-80 PC gives –.000001372368394

Exponentiation is weak in accuracy when results are very large numbers. It is worse still when the base used is close to, but less than 1, because of the poor accuracy in the logarithm in the first place.

Example: $.99999684^{71409500}$ = 9.989631172 E–99
TRS-80 gives 9.996756992 E–99

The EXP function is calculated internally by calculation of $10^{.434294481903X}$ and is accurate to 9 digits for large inputs and ten digits for smaller ones.

MEMORY SURPRISE!!

Here is another interesting tid-bit from *Norlin Rober.* Try the following sequence of operations on your Radio Shack TRS-80 Pocket Computer:

1) Clear the computer with the NEW command.
2) Enter this short program with the computer in the PRO mode: 1: 1OOOOOO (These are letter O's, not zeros.)
3) Stay in the PRO mode and clear out the above entry by keying: 1 ENTER.
4) Switch the computer to the RUN mode, key in 2^2 followed by the ENTER key.
5) Key A$(204) and press the ENTER key.
Hit the cursor "back" key, then the ENTER key.
Hit the cursor "back" key and the ENTER key again.
Press the CL key.
6) Key in MEM and hit the ENTER key.

Are you excited by what you see? Well, have fun experimenting. Norlin warns not to get too excited because he has discovered, for instance, that in this mode memory addresses 23 to 82 overlap 87 to 146. Also, A(83) to A(86) now appear to be the storage registers for FOR/NEXT loops in that they contain the address of the variable used as the index in a loop, the test value, step size and return address in hexadecimal format. If you do some experimenting, let us know what you come up with when using the computer in this mode.

TIMING COMPARISONS

Interested in programming for maximum speed on the TRS-80 PC? We have conducted a number of tests that indicate the order of variable useage should be as follows:

Fastest variables = W, X, Y and Z.
Followed by variables A through V.
Then A(23) through A(99).
Followed by A(100) through available memory.
Then the variables assigned as A(1) – A(9).
Slowest variables are those assigned A(10) – A(22).

The variables W – Z are about 18 percent faster than A through V. They are some 80 percent faster than using the designation A(10) – A(22)!

OOPS! THERE'S A HOLE IN OUR POCKET!

Two typographical errors snuck into the payroll tax program published in the POCKET COMPUTER NEWSLETTER, Issue 03. Correct the following lines:

```
65 X=.15*(T-27):RETURN
                    and
71 X=31.29+.26*(T-196):RETURN
```

SOLVING LINEAR EQUATIONS

This program calculates the solution of a system of up to 12 linear equations, using Gaussian elimination.

```
1 "A" INPUT "NO. OF EQ.?";A:A=A+1:B=0
2 "C" BEEP 1:FOR C=7 TO A+6:INPUT A(C+AB):NEXT C
  :IF B=0 GOTO 5
3 FOR D=1 TO B:E=A(A+AB-D+6):F=A(AD-D+6)
4 FOR C=7+AB TO A+C-1:A(C)=A(C)-A(C+AD-A-AB)E/F:
  NEXT C:NEXT D
5 IF A(C-B-1)=0 BEEP 1:PRINT "REJECTED":GOTO 2
6 B=B+1:IF A-B-1 GOTO 2
7 FOR B=1-A TO -1:F=6-AB:E=A(F)/A(F+B):A(F)=E:IF
  B+2 GOTO 9
8 FOR C=1 TO -B-1;F=AC+6:A(F)=A(F)-A(F+B)E:NEXT C:
  NEXT B
9 BEEP 1:FOR B=1 TO A-1:E=A(AA-AB+6):PRINT B;"  ";
  E:NEXT B:END
```

If an error in entry of coefficients is made, a correction may be made by keying SHIFT C, then re-entering the entire row of coefficients in which the error was made.

(continued on page 4)

```
5 P/R002 "ALLAN MCCROSKERY 1981"
10 "—" REM "P/R002"
20 P. "JOB ESTIMATE:SHIFT A"
30 P. "HOURS AND COST:SHIFT S"
40 P. "BILLING CHECK:SHIFT D"
50 GOTO 20
60 REM "ESTIMATE FOR JOBS"
70 "A":CL.:INPUT "BEVS DAYS? ";B:D=B*450
80 P. "BEV ";B;"DAY = $ ";D
90 INPUT "ALS DAYS? ";A:C=A*450
100 P. "AL ";A;"DAY = $ ";C
110 INPUT "TEDS DAYS? ";T:U=T*337.5
120 P. "TED ";T;"DAY = $ ";U
130 INPUT "GARY DAYS? ";G:H=G*243.75
140 P. "GARY ";G;"DAY = $ ";H
150 INPUT "MACES DAYS? ";M:N=M*243.75
160 P. "MACE ";M;"DAY = $ ";N
200 Q=B+A:P=D+C
210 P. "PART ";Q;"DS = $ ";P
220 P. "ASSOC ";T;"DS = $ ";U:R=G+M:S=H+N
230 P. "SR DSN ";R;"DS = $ ";S:E=P+U+S
240 GOTO 600
300 REM "HOURS AND COST CHECK"
310 "S":CL.:INPUT "BEVS HRS? ";B
320 INPUT "ALS HRS? ";A:Q=A+B:P=Q*60
330 P. "PART ";Q;"HRS = $ ";P
340 INPUT "TEDS HRS? ";T:U=T*45
350 P. "ASSOC ";T;"HRS = $ ";U
360 INPUT "GARYS HRS? ";G
370 INPUT "MACES HRS? ";M:R=G+M:S=R*32.5
380 P. "SR DSN ";R;"HRS = $ ";S:E=P+U+S
390 GOTO 520
440 REM "BILLING CHECK"
450 "D":CL.:INPUT "PART HRS? ";Q:P=Q*60
460 P. "PART ";Q;"HRS = $ ";P
470 INPUT "ASSOC HRS? ";T:U=T*45
480 P. "ASSOC ";T;"HRS = $ ";U
490 INPUT "SR DES HRS? ";R:S=R*32.5
500 P' "SR DES ";R;"HRS = $ ";S:E=P+U+S
520 P. "DSN COST = $ ";E
530 INPUT "CONN TAX Y/N? ";I:IF I="Y" GOSUB 700
535 IF I="N" GOTO 760
540 Z=E+1:P. "DES + TX = $ ";Z
550 INPUT "REIMBURSABLES? $ = ";F:X=X+F:GOTO 550
555 P. "REIMB TOTAL = $ ";X
560 W=E+X:P. "T/WOTX = $ ";W
570 Y=Z+X:P. "TOTAL = $ ";Y
580 END
600 P. "DSN COST = $ ";E
610 INPUT "CONN TAX Y/N? ";I:IF I="Y" GOSUB 700
620 INPUT "REIMBURSABLES? $ = ";F
630 W=E+F:INPUT "CONTINGENCY? % = ";J:L=INT (W*J+.5)/100
640 P. "DES + REIMB $ = ";W:O=W+L
650 P. "T/WOTX $ ";O:V=O+I
660 P. "T/WTX = $ ";V
670 END
700 I=INT(E*3.5+.5)/100
710 P. "CONN TAX = ";I
720 RETURN
760 INPUT "REIMBURSABLES? = $ ";F:X=X+F:GOTO 760
770 P. "REIMB TOTAL = $ ";X
780 W=E+X:P. "TOTAL = $ ";W
790 END
```

ASSIGNMENT OF VARIABLES

A = AL'S TIME
B = BEV'S TIME
C = AL'S COSTS
D = BEV'S COSTS
E = DESIGN COSTS
F = REIMBURSABLES
G = GARY'S TIME
H = GARY'S COSTS
I = CONN SALES TAX
J = CONTINGENCY %
K = ...not assigned.....
L = CONTINGENCY AMT
M = MACE'S TIME
N = MACE'S COSTS
O = DESIGN+REIMB+ CONTINGENCY
P = PARTNER'S COSTS
Q = PARTNER'S TIME
R = SD.DES TIME
S = SD.DES COSTS
T = TED'S TIME
U = TED'S COSTS
V = O + CONN SALES TAX
W = DESIGN + REIMBURSABLES
X = TOTAL REIMBURSABLES
Y = DESIGN+CONN TAX+REIMB
Z = DESIGN COSTS + CONN TAX

This is Allan McCroskery's *Estimating and Billing* program. He says it saves him a lot of adding machine tape! The program is divided into three sections. The first section is used to make estimates on a job. This section includes the costs of key persons working on the job, a lump sum figure for reimbursables and a "contingency factor" expressed as an added percentage. It is used to make quick estimates. The second section assists in the making up of bills. Actual hours spent on a job are inputted from time sheets. This section also adds a state service tax where applicable. The third section is used for verification purposes. Any questions? Al's address is: %Bevilacqua, McCroskery & Associates, Inc., 327 Main Avenue, Norwalk, CT 06851.

(continuation from page 2)

If the order in which the rows of coefficients are entered is not acceptable for the algorithm used by the program, "REJECTED" will be displayed (this happens infrequently) and the row just entered will need to be re-entered later. If this rejection occurs after every row has been entered, there is no unique solution (the system is inconsistent or dependent).

If desired, the display of the entire solution can be repeated by keying RUN 9, ENTER.

An example: To solve the system

$$\begin{aligned} 3W + 2X + 6Y + 2Z &= 2 \\ W + 4X + 3Y + 2Z &= 6 \\ 2W + X + 9Y + 3Z &= 2 \\ 4W + 3X + 6Y + Z &= 8 \end{aligned}$$

which has the solution W=-2, X=3, Y=2 and Z=-5; proceed as follows.

SHIFT A (Computer must be in DEF mode.)

"NO. OF EQ.?" is displayed; input 4 and ENTER.

Beep prompts for input of equation; inputs to enter for this example are 3, 2, 6, 2, 2.

Beep prompts for input of next equation; input 1, 4, 3, 2, 6.

Next equation; input 2, 1, 9, 3, 2.

Next equation; input 4, 3, 6, 1, 8.

Beep indicates completion of execution, solution is displayed as follows:

1. -2
2. 3
3. 2
4. -5

Notes

The execution time required to solve a system varies according to the number of terms in the system. For a system of two equations, it is about 10 seconds; three equations, 21 seconds; four, 43 seconds; etc. A system of 12 takes a little over 14 minutes.

Practically all of the memory not actually used by the program statements is required for data. Any modification that lengthens the program will reduce the number of usable equations to less than 12.

This program was submitted by: *Norlin Rober, 407 North 1st Avenue, Marshalltown, IA 50158.*

SHARE YOUR POCKET COMPUTER KNOWLEDGE

We are always interested in hearing about applications for pocket computers, new products and news of the industry. Do you know of any operating time-savers, programming tips, short cuts or technical information that might be of interest to others?

If so, write it up! If your submission is accepted for publication you will earn a cash reward. If we cannot use your material, we will endeavor to promptly return it *provided you include a self addressed stamped envelope for that purpose.* We are careful, but we cannot assume responsibility for submitted materials.

Submissions should be addressed to: **The Editor, PC NEWSLETTER, PO Box 232, Seymour, CT 06483**

FROM THE WATCH POCKET

A program for the TRS-80 PC that helps restaurant owners forecast what sales revenues are needed to return a satisfactory profit is provided in the March/April issue of the 80-U.S. Journal. The article, written by John D. Farrell of Tacoma, Washington, starts on page 34 of the magazine.

Neil Maller of Fort Wayne, Indiana, reports that he has been successfully using a GE microcassette tape recorder, model 3-5340/SS 3 for program storage. Despite a tape speed of only 15/16 ips and the fact that the recorder is designed for dictation work, he reports results as "entirely satisfactory." He also indicates that the particular model mentioned has the handy feature of being operable in the fast forward and rewind modes without having to unplug the remote control plug. The price range of the GE microcassette is comparable to the tape recorder unit recommended by Radio Shack for use with their TRS-80 PC.

Did you know you could actually send a kid to summer camp to learn about computers? Yes, Dr. Michael Zabinski, a professor at Fairfield University in Connecticut, directs such a camp. Two sessions are offered during the month of July. For further information, contact Dr. Zabinski at (203) 795-9069 or write to: Computer Camp, Grand View Lodge, Box 22, Moodus, CT 06469.

Several people have reported difficulties with their TRS-80 PC "crashing" when in the PRO mode. The keyboard completely locks up. The only way to clear the situation is depress the reset switch on the back of the unit. Of course, that destroys whatever is in memory. Apparently Radio Shack doesn't have the answer to the problem. They have offered to exchange units exhibiting the problem, but one writer indicated that the new unit he received continued to behave similarly. Another writer reported that R. S. claimed the problem "might be caused by static electricity." Say, better be careful not to scruff across the carpets when you are working on a new program!

Radio Shack will not confirm rumors that new peripherals are being designed for the PC. Nor will they make any comments about sales to date. But, several industry observers peg the figure at around 50,000 units.

COMING ATTRACTIONS

In the next several editions of the POCKET COMPUTER NEWSLETTER we have all sorts of goodies scheduled. There will be more operating hints and tips. We have a whole series of programs ranging from some first class games to more serious applications such as finding prime factors and a speedy Shell/Walters sort routine. There will be more software reviews such as appeared in issues 02 and 03. We will be publishing a list of "tokens" used in the TRS-80 PC. Plus, news related to pocket computers from around the industry.

You will note that we have gone to a smaller type in this issue so as to cram in more information. If user contributions and interest expands, we will increase the number of pages per issue. We expect this to happen as soon as the Panasonic/Quasar units get into circulation.